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PATENT APPLICATION

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IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Nitzan Peleg et al.

Confirmation No.: 6064

Application No.: 10/813,843

Examiner: Rose, Helene Roberta

Filing Date: March 31, 2004

Group Art Unit: 2163

Title: METHOD AND APPARATUS FOR REFRESHING MATERIALIZED VIEWS

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Commissioner For Patents
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TRANSMITTAL OF APPEAL BRIEF

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on July 5, 2007.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) \$500.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

(a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

1st Month
\$120

2nd Month
\$450

3rd Month
\$1020

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\$1590

The extension fee has already been filed in this application.

(b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of \$ 500. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees.

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Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Nitzan Peleg et al.

Serial No.: 10/813,843

Filed: March 31, 2004

For: Method and Apparatus for Refreshing
Materialized Views

§ Confirmation No.: 6064
§ Group Art Unit: 2163
§ Examiner: Rose, Helene Roberta
§
§ Atty Docket: 200311278-1
§ NUHP:0239/BLT/GIL

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August 23, 2007
Date

Eddie Lou Robinson
Eddie Lou Robinson

APPEAL BRIEF PURSUANT TO 37 C.F.R. §§ 41.31 AND 41.37

This Appeal Brief is being filed in furtherance to the Notice of Appeal mailed on July 2, 2007, and received by the Patent Office on July 5, 2007.

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1. **REAL PARTY IN INTEREST**

The real party in interest is Hewlett-Packard Development Company, LP, the Assignee of the above-referenced application by virtue of the Assignment to Hewlett-Packard Development Company, LP, recorded at reel 015176, frame 0998, and dated March 31, 2004. Accordingly, Hewlett-Packard Development Company, LP, as the parent company of the Assignee of the above-referenced application, will be directly affected by the Board's decision in the pending appeal.

2. **RELATED APPEALS AND INTERFERENCES**

Appellants are unaware of any other appeals or interferences related to this Appeal. The undersigned is Appellants' legal representative in this Appeal.

3. **STATUS OF CLAIMS**

Claims 1-22 are currently pending, are currently under final rejection and, thus, are the subject of this Appeal.

4. **STATUS OF AMENDMENTS**

There are no outstanding amendments to be considered by the Board.

5. **SUMMARY OF CLAIMED SUBJECT MATTER**

The present invention relates generally to the field computer data bases, particularly, to methods and systems employing materialized views responding to user

queries of the data bases using materialized views. The methods and systems are adapted to improve efficiencies of refresh operations associated with materialized views, thereby enabling users to easily perform queries on the data bases.

The Application contains five independent claims, namely, claims 1, 6, 11, 12 and 20, all of which are the subject of this Appeal. The subject matter of these claims is summarized below.

With regard to the aspect of the invention set forth in independent claim 1, discussions of the recited features of claim 1 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with claim 1 provides a system (e.g., 10) for performing refresh operations, comprising a base table (e.g., 84) having a first plurality of data entries, and a first materialized view (e.g., 172) that comprises a second plurality of data entries, the second plurality of data entries being associated with the first plurality of data entries in the base table. *See, e.g., id.* at paragraphs 44-45; *see also* Figs. 1, 2 and 5. The system further comprises a refresh log (e.g., 178) that contains a plurality of changes in the base table, and a module (e.g., 92) adapted to perform a refresh operation on the first materialized view using the second plurality of data entries. *See, e.g., id.* at paragraph 45; *see also* Fig. 2. The module is configured to access the refresh log and the first materialized view, and calculate a plurality of delta values from the plurality of changes in the refresh log and the second plurality of data entries in the first materialized view. *See, e.g., id.* at paragraphs 37, 48; *see also* Fig. 3. The module (e.g., 92) is further configured to apply

the plurality of delta values to the second plurality of data entries in the first materialized view, and provide the plurality of delta values to a delta adaptation module (e.g., 202) for updating a second materialized view. *See, e.g., id.* at paragraphs 48-51; *see also* Fig. 6.

With regard to the aspect of the invention set forth in independent claim 6, discussions of the recited features of claim 6 can be found at least in the below cited locations of the specification and drawings. By way of example, embodiments in accordance with claim 6 provide a system for performing a pipelined refresh, comprising a first materialized view (e.g., 172) derived at least partially from a base table (e.g., 84), and a refresh log (e.g., 178) having a plurality of entries, each of the plurality of entries corresponding to a change in the base table. *See, e.g., id.* at paragraphs 44, 45; *see also* Figs. 3 and 5. The system further comprises a second materialized view (e.g. 174) derived at least partially from the first materialized view, and a refresh module (e.g., 92), comprising a first delta calculation module (e.g., 192) that calculates a plurality of delta values that represents the changes to the first materialized view. *See, e.g., id.* at paragraphs 44, 45; *see also* Figs. 3, 5. The refresh module further comprises a first delta processing module (e.g., 200) that applies the plurality of delta values to the first materialized view, and a delta adaptation module (e.g., 202) that receives the plurality of delta values from the first delta calculation module and calculates a plurality of changes to the second materialized view. *See, e.g., id.* at paragraphs 47, 49; *see also* Fig. 6. Further, the refresh module comprises a second delta calculation module (e.g., 218) that obtains the plurality of changes to the second materialized view from the delta adaptation module, and a second delta processing module (e.g., 222) that applies the plurality of

changes to the second materialized view from the second delta calculation module to the second materialized view. *See, e.g., id.* at paragraphs 50-52; *see also* Fig. 6.

With regard to the aspect of the invention set forth in independent claim 11, discussions of the recited features of claim 11 can be found at least in the below cited locations of the specification and drawings. By way of example, embodiments in accordance with claim 11 provide a system for performing a refresh operation, comprising means (e.g., 172) for deriving a first materialized view from at least one base table (e.g., 84), and means (e.g., 92) for accessing a refresh log (e.g., 178) and the first materialized view to perform the refresh operation on the first materialized view. *See, e.g., id.* at paragraphs 27, 37 and 44; *see also* Figs. 2 and 5. The system further comprises means (e.g., 94) for calculating a plurality of delta values by combining a plurality of changes in the refresh log and a plurality of entries in the first materialized view. *See, e.g., id.* at paragraphs 27 and 47. Further, the system comprises means (e.g., 200) for applying the plurality of delta values to the first materialized view, and means (e.g., 198) for providing the plurality of delta values to a delta adaptation module for refreshing a second materialized view. *See, e.g., id.* at paragraph 48; *see also* Fig. 6.

With regard to the aspect of the invention set forth in independent claim 12, discussions of the recited features of claim 12 can be found at least in the below cited locations of the specification and drawings. By way of example, embodiments in accordance with claim 12 provide a method of performing a refresh operation,

comprising deriving a first materialized view (e.g., 172) from a base table, and obtaining a refresh log (e.g., 178) and the first materialized view to perform the refresh operation on the first materialized view. *See, e.g., id.* at paragraph 45; *see also* Figs. 2 and 5. The method further comprises calculating a plurality of delta values by combining a plurality of changes in the refresh log and a plurality of entries in the first materialized view. *See, e.g., id.* at paragraphs 37 and 46; *see also* Fig. 6. Further, the method comprises applying the plurality of delta values to the first materialized view, and providing the plurality of delta values to a delta adaptation module (e.g., 202) for refreshing a second materialized view derived from the first materialized view. *See, e.g., id.* at paragraph 48-51; *see also* Fig. 6.

With regard to the aspect of the invention set forth in independent claim 20, discussions of the recited features of claim 20 can be found at least in the below cited locations of the specification and drawings. By way of example, embodiments in accordance with claim 20 provide a machine readable medium (e.g., 20, 50), and a refresh log (e.g., 178) stored on the machine readable medium, the refresh log containing a plurality of change entries. *See, e.g., id.* at paragraphs 14 and 45; *see also* Fig. 1. The computer program further comprises a refresh manager (e.g., 88) stored on the machine readable medium, the refresh manager being adapted to refresh a first materialized view (e.g., 172) derived at least in part from a base table (e.g., 84) by computing a plurality of delta values in a delta calculation module (e.g., 94) based on the refresh log and the first materialized view. *See, e.g., id.* at paragraph 21 and 44-45; *see also* Figs. 2 and 5. The

computer program further comprises applying the plurality of delta values in a delta processing module (e.g., 96) to the first materialized view, and providing the plurality of delta values to a delta adaptation module (e.g., 202) derived from the first materialized view. *See, e.g., id.* at paragraph 27 and 28.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

First Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's first ground of rejection in which the Examiner rejected claims 1, 3, 5, 11-17 and 20 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,963,959 to Sun et al., ("the Sun reference").

Second Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's second ground of rejection in which the Examiner rejected claims 2, 4, 6, 10, 18, 19, 21 and 22 under 35 U.S.C. § 103(a) as being obvious over the Sun reference in view of U.S. Patent No. 7,111,020 to Gupta ("the Gupta reference").

7. ARGUMENT

As discussed in detail below, the Examiner has improperly rejected the pending claims. Further, the Examiner has misapplied long-standing and binding legal precedents and principles in rejecting the claims under Sections 102 and 103. Accordingly,

Appellants respectfully request full and favorable consideration by the Board, as

Appellants respectfully assert that claims 1-22 are currently in condition for allowance.

A. **First Ground of Rejection:**

With respect to the rejection of independent claims 1, 11, 12 and 20 the Examiner stated the following:

Regarding Claim 1, Sun teaches a system for performing refresh operations, the system comprising:
a base table having a first plurality of data entries (Figures 2A, B, C, diagram 200, Sun);
a first materialized view that comprises a second plurality of data entries, the second plurality of data entries being associated with the first plurality of data entries in the base table (Figures 2A, B, all features, wherein defined in column 4, lines 29-41, wherein a series of modifications a user might make to a master table and the corresponding entries recorded in a master log and master table 200 within FIG. 2(a) is a table of customer information including a column for a primary key CID, a customer identifier, and a column ZIP for a customer's ZIP code, wherein each row represents a particular customer, who is assigned a non-null, unique identifier, CID, wherein the corresponding master log 210 is empty and wherein master table 200 of FIG. 2(b) is the result of adding a new customer with a CID of 5 and a ZIP of 22046 to master table 200 of FIG. 2(a), wherein the primary key value of the inserted row, 5, is recorded in master log 210, Sun);
a refresh log that contains a plurality of changes in the base table (Figure 2C, wherein column 4, lines 42-49, the result of deleting the customer identified CID of 2 from the master table, the primary key value of 2 is stored as a new entry in master log, wherein if the zip code of customer CID of 4 in master table is changed from 22090 to 20190, then the master table is the result, the primary key value 4 of the updated row is stored as a new entry in master log, Sun); and
a module adapted to perform a refresh operation on the first materialized view using the second plurality of

data entries, the module configured to (Figure 3, all features, wherein column 5, lines 10-15, the operation of a fast refresh mechanism, wherein the primary key values are selected from the master log which are not found in the master view the, the result of reissuing the snapshot definition query on the master table, Sun);

access the refresh log and the first materialized view (column 6, lines 65-66, wherein master table is accessed by the primary key values recorded I the master log, Sun);

calculate a plurality of delta values from the plurality of changes in the refresh log and the second plurality of data entries in the first materialized view (column 6, lines 43-45, wherein two new rows with column primary key, i.e. CID, of 5 and 6 are added, resulting in snapshot, diagram 400 within Figure 4e, Sun);

apply the plurality of delta values to the second plurality of data entries in the first materialized view (Figures 7A and B, all features, wherein defined in column 8, lines 52-67, Sun); and

provide the plurality of delta values to a delta adaptation module for updating a second materialized view (column 9, lines 27-49, Sun).

Regarding Claim 11, Sun teaches a system for performing a refresh operation, comprising:

means for deriving a first materialized view from at least one base table (refer to claim 1, wherein this limitation substantially the same/or similar, Sun);

means for accessing a refresh log and the first materialized view to perform the refresh operation on the first materialized view (refer to claim 1, wherein this limitation substantially the same/or similar, Sun);

means for calculating a plurality of delta values by combining a plurality of changes in the refresh log and a plurality of entries in the first materialized view (refer to claim 1, wherein this limitation substantially the same/or similar, Sun);

means for applying the plurality of delta values to the first materialized view (refer to claim 1, wherein this limitation substantially the same/or similar, Sun); and

means for providing the plurality of delta values to a delta adaptation module for refreshing a second materialized view (refer to claim 1, wherein the limitation substantially the same/or similar, Sun).

Regarding Claim 12, Sun teaches a method of performing a refresh operation, the method comprising:
deriving a first materialized view from a base table (refer to claim 1, wherein the limitation substantially the same/or similar, Sun);

obtaining a refresh log and the first materialized view to perform the refresh operation on the first materialized view (refer to claim 1, wherein the limitation substantially the same/or similar, Sun);

calculating a plurality of delta values by combining a plurality of changes in the refresh log and a plurality of entries in the first materialized view (refer to claim 1, wherein the limitation substantially the same/or similar, Sun);

applying the plurality of delta values to the first materialized view (refer to claim 1, wherein the limitation substantially the same/or similar, Sun); and

providing the plurality of delta values to a delta adaptation module for refreshing a second materialized view derived from the first materialized view (refer to claim 1, wherein the limitation substantially the same/or similar, Sun).

Regarding Claim 20, Sun teaches a computer program, comprising:
a machine readable medium (column 3, lines 59-65,

Sun);
a refresh log stored on the machine readable medium, the refresh log containing a plurality of change entries (refer to claim 1, wherein the limitation substantially the same/or similar, Sun); and

a refresh manager stored on the machine readable medium, the refresh manager being adapted to refresh a first materialized view derived at least in part from a base table by computing a plurality of delta values in a delta calculation module based on the refresh log (column 8, lines 55-64, wherein MOD\$\$ has three values: 'I' for insert, 'D' for delete, and 'U' for update and the updateable snapshot log 710 has an old/new column, wherein the

OLD\$\$, which indicates whether a primary key value for the row is old, i.e., O, or new, i.e. U, or unchanged, i.e., U, which is interpreted to be the “plurality of data values”, column 6, lines 43-44, wherein two new rows with CID of 5 and 6 are added resulting in a snapshot, in which this is interpreted to be equivalent to “the refresh manager being adapted to refresh a first materialized view derived at least in part from a base table by computing a plurality of delta values in a delta calculation module based on the refresh log”, wherein the refresh manager is interpreted to be the “snapshot”, Sun), and the first materialized view, applying the plurality of delta values in a delta processing module to the first materialized view (refer to claim 1, wherein the limitation substantially the same/or similar, Sun), and providing the plurality of delta values to a delta adaptation module derived from the first materialized view (refer to claim 1, wherein the limitation substantially the same/or similar, Sun).

Final Office Action, pp. 3-7, 9 and 10.

Appellants respectfully traverse the rejection.

1. **Judicial precedent has clearly established a legal standard for a *prima facie* anticipation rejection.**

Anticipation under Section 102 can be found only if a single reference shows exactly what is claimed. *Titanium Metals Corp. v. Banner*, 227 U.S.P.Q. 773 (Fed. Cir. 1985). Thus, for a prior art reference to anticipate under Section 102, every element of the claimed invention must be identically shown in a single reference. *In re Bond*, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990). Moreover, the prior art reference also must show the *identical* invention “*in as complete detail as contained in the ... claim*” to support a *prima facie* case of anticipation. *Richardson v. Suzuki Motor Co.*, 9 U.S.P.Q. 2d 1913,

1920 (Fed. Cir. 1989) (emphasis added). Accordingly, Appellants need only point to a single element not found in the cited reference to demonstrate that the cited reference fails to anticipate the claimed subject matter.

2. **The Examiner's rejection of independent claims 1, 11, 12 and 20 is improper because the rejection fails to establish a *prima facie* case of anticipation.**

Independent claim 1 recites:

A system for performing refresh operations, the system comprising:
a base table having a first plurality of data entries;
a first materialized view that comprises a second plurality of data entries, the second plurality of data entries being associated with the first plurality of data entries in the base table;
a refresh log that contains a plurality of changes in the base table; and
a module adapted to perform a refresh operation on the first materialized view using the second plurality of data entries, the module configured to;
access the refresh log and the first materialized view;
calculate a plurality of delta values from the plurality of changes in the refresh log and the second plurality of data entries in the first materialized view;
apply the plurality of delta values to the second plurality of data entries in the first materialized view; and
provide the plurality of delta values to a delta adaptation module for updating a second materialized view.
(Emphasis added.)

Independent claim 11 recites:

A system for performing a refresh operation, comprising:
means for deriving a first materialized view from at least one base table;

means for accessing a refresh log and the first materialized view to perform the refresh operation on the first materialized view;

means for calculating a plurality of delta values by combining a plurality of changes in the refresh log and a plurality of entries in the first materialized view;

means for applying the plurality of delta values to the first materialized view; and

means for providing the plurality of delta values to a delta adaptation module for refreshing a second materialized view. (Emphasis added.)

Independent claim 12 recites:

A method of performing a refresh operation, the method comprising:

deriving a first materialized view from a base table;
obtaining a refresh log and the first materialized view to perform the refresh operation on the first materialized view;

calculating a plurality of delta values by combining a plurality of changes in the refresh log and a plurality of entries in the first materialized view;

applying the plurality of *delta values* to the first materialized view; and

providing the plurality of delta values to a *delta adaptation module* for refreshing a second materialized view derived from the first materialized view. (Emphasis added.)

Independent claim 20 recites:

A computer program, comprising:
a machine readable medium;
a refresh log stored on the machine readable medium, the refresh log containing a plurality of change entries; and

a refresh manager stored on the machine readable medium, the refresh manager being adapted to refresh a first materialized view derived at least in part from a base table by computing a plurality of *delta values in a delta calculation module* based on the refresh log and the first materialized view, *applying* the plurality of delta values in a delta processing module to the first materialized view,

and *providing* the plurality of delta values to a *delta adaptation module* derived from the first materialized view.
(Emphasis added.)

Appellants respectfully submit that the rejection under Section 102 of independent claims 1, 11, 12 and 20 is improper because the prior art reference used to reject the independent claims does not disclose each and every element recited by the independent claims. Moreover, Appellants contend that the passages of the Sun reference referred to by the Examiner clearly do not disclose the above claim limitations. For example, the Sun reference states that “[t]he master table itself is accessed by the primary key values recorded in the master log.” Sun, col. 6, lines 65-66. This disclosure has been interpreted by the Examiner to correspond to the claimed module configured to access the refresh log and the first materialized view, as recited by the independent claims. This analysis incorrectly equates Sun’s master table for Appellants’ claimed *refresh log*. However, as appreciated by those skilled in the art, a master table is clearly not a refresh log. Therefore, the Sun reference does not teach the claimed module configured to access the refresh log and the first materialized view.

In the Response to Arguments section of the Office Action the Examiner further contended that the claimed module adapted to perform a refresh operation on the first materialized view using the second plurality of data entries is anticipated by Sun. To this effect, the Examiner specifically stated:

wherein an updateable snapshot is a snapshot to which a user at the snapshot site is allowed to make changes, ...

See, Final Office Action, p. 17

It appears that the Examiner has interpreted the user's ability to make changes to the snapshot, as disclosed above by Sun, to be equivalent to the module performing refresh operation to the materialized views based on changes in the base table. Again, the Examiner's interpretation of the Sun references is simply flawed. The claimed module and its functionality pertaining to refresh operations, as recited by the claims, are not and can not be equated with the user's ability to update a snap shot. Therefore, the Sun reference does not disclose or suggest a module adapted to perform a refresh operation on the first materialized view using the second plurality of data entries, as for example, recited by independent claim 1.

In rejecting the claims, the Examiner further brought forth Sun's disclosure stating that:

In the example, two new rows with CIDs of 5 and 6 are added, resulting in snapshot 400 of FIG. 4(e). The result of all these operations in the fast refresh is that snapshot 400 of FIG. 4(e) is consistent with master view 404.

Sun, col. 6, lines 43-45.

This disclosure describes two new rows added to a snapshot (materialized view) which the Examiner interpreted to read the claimed module configured to calculate a plurality of delta values from the plurality of changes in the refresh log and the second plurality of data entries in the first materialized view. Appellants note that the above-cited disclosure of the Sun reference clearly does not teach a plurality of delta values, let alone calculating such delta values from a plurality of changes in a refresh log and a second plurality of

data values in a first materialized view. Absent any such disclosure, the Appellants respectfully assert that the rejection of independent claims 1, 11, 12 and 20 based on the Sun reference is defective and should be withdrawn.

In advancing the rejection of the claims, the Examiner further cited the following portion of the Sun reference, which states that:

FIGS. 7(a)-7(e) illustrate a series of modifications made to a master table and the corresponding entries recorded in a master log. Updateable snapshot 700 of FIG. 7(a) is a snapshot of customer information including a column for a primary key CID, a customer identifier, and a column ZIP for a customer's ZIP code. Each row represents a particular customer, who is assigned a non-null, unique identifier, CID. At this point, the corresponding updateable snapshot log 710 is empty.

Updateable snapshot log 710 comprises at least four columns. Updateable snapshot log 710, like master log 210, has one or more columns for the primary key, in this example, a CID column and a column for a refresh timestamp, TIME\$\$ as described above. In addition, updateable snapshot log 710 has a column MOD\$\$ which indicates the kind of modification performed. In one embodiment, MOD\$\$ has three values: 'I' for insert, 'D' for delete, and 'U' for update. Furthermore, updateable snapshot log 710 has an old/new column, OLD\$\$, which indicates whether a primary key value for the row is old ('O'), new ('N'), or unchanged ('U'). In one embodiment, the MOD\$\$ and OLD\$\$ columns are also present in the master logs.

Updateable snapshot 700 of FIG. 7(b) is the result of adding a new customer with a CID of 5 and a ZIP of 22046 to updateable snapshot 700 of FIG. 7(a).

Sun, col. 8, lines 52-67.

The above disclosure merely describes column entries of snapshot tables 700 and 710, but clearly does not teach a module configured to apply the plurality of delta values to the second plurality of data entries in the first materialized view, as recited by independent claims 1, 11, 20. Absent such a teaching, suggestion or illustration, the rejection of Appellants' claims based on Sun should be withdrawn.

For at least these reasons, Appellants assert that the rejection under Section 102 of independent claims 1, 11, 12 and 20, as well as, claims dependent thereon is improper. Accordingly, Appellants respectfully request the Board to reverse the rejection and allow independent claims 1, 11, 12 and 20, as well as, those claims depending therefrom.

B. Second Ground of Rejection:

With respect to the rejection of independent claim 6, the Examiner stated the following:

Regarding Claim 6, Sun in view of Gupta teaches a system for performing a pipelined refresh, the system comprising:

- a first materialized view derived at least partially from a base table (Figure 1B, diagram 142, Gupta);
- a refresh log having a plurality of entries, each of the plurality of entries corresponding to a change in the base table (refer to claim 1, wherein this limitation has already been addressed, Sun), a second materialized view derived at least partially from the first materialized view (Figure 1B, diagram 144, Gupta);
- a refresh module that comprises;
- a first delta calculation module that calculates a plurality of delta values that represents the changes to the first materialized view (column 2, lines 31-36, Gupta);

- a first delta-processing module that applies the plurality of delta values to the first materialized view (column 2, lines 37-41, Gupta);
- a delta adaptation module that receives the plurality of delta values from the first delta calculation module and calculates a plurality of changes to the second materialized view (column 3, lines 51-57, Gupta);
- a second delta calculation module that obtains the plurality of changes to the second materialized view from the delta adaptation module (Figure 4B-1 and 2, and 4C-1 and 2, all features, wherein it illustrates a log used to track changes to base tables for an incremental refresh mechanism, Gupta); and
- a second delta-processing module that applies the plurality of changes to the second materialized view from the second delta calculation module to the second materialized view (Figure 5A, diagrams 502, 504 and 506, Gupta).

Final Office Action, pp. 11, 12

Appellants respectfully traverse the rejection.

1. **Judicial precedent has clearly established a legal standard for a *prima facie* obviousness rejection.**

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (B.P.A.I. 1979). In establishing a *prima facie* case for obviousness, it is often necessary “to look to interrelated teachings of multiple patents, the effects of demands known to the design community or present in the market place; and the background knowledge possessed by a person having ordinary skill in the art.” *KSR Int’l Co. v. Teleflex, Inc.* No. 04-1350, slip op. at 14 (U.S. April 30, 2007). Indeed, “the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained;

and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or nonobviousness of the subject matter is determined.” *Id.* at 2 (quoting *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). This analysis should be made explicit. *Id.* at 14 (citing *In re Khan*, 441 F.3d 977, 988 (Fed. Cir. 2006)) (“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness”).

Additionally, a claim having several elements is *not* proved obvious merely by demonstrating that each of its elements was known in the prior art. *Id.* As such, the obviousness inquiry does not hinge on demonstrating that elements were known in the art. Rather, the obviousness inquiry focuses on whether the claimed subject matter would have been obvious to persons having ordinary skill in the art in view of the demands and practices of the design community at the time of filing of the application. *See id.*

2. **The Examiner’s rejection of independent claim 6 is improper because the rejection fails to establish a *prima facie* case of obviousness.**

Independent claim 6 recites:

A system for performing a pipelined refresh, the system comprising:
 a first materialized view derived at least partially from a base table;
 a refresh log having a plurality of entries, each of the plurality of entries corresponding to a change in the base table,
 a second materialized view derived at least partially from the first materialized view;

a refresh module that comprises;
a first *delta* calculation module that calculates a plurality of delta values that represents the changes to the first materialized view;
a first delta processing module that applies the plurality of delta values to the first materialized view;
a *delta adaptation module* that receives the plurality of delta values from the first delta calculation module and calculates a plurality of changes to the second materialized view;
a second *delta calculation module* that obtains the plurality of changes to the second materialized view from the delta adaptation module; and
a second delta processing module that applies the plurality of changes to the second materialized view from the second delta calculation module to the second materialized view. (Emphasis added.)

In rejecting independent claim 6, the Examiner primarily cited the Gupta reference as disclosing the above claim elements. However, in contrast to the Examiner's assertions, Appellants contend that the Gupta reference does not disclose or suggest such elements. For example, as set forth in the rejection, the Examiner cited the following passage of the Gupta reference:

Materialized views eliminate the overhead associated with gathering and deriving the data every time a query is executed. Computer database systems that are used for data warehousing frequently maintain materialized views that contain pre-computed summary information in order to speed up query processing. Such summary information is created by applying an aggregate function, such as SUM, COUNT, or AVERAGE, to values contained in the base tables. Materialized views that contain pre-computed summary information are referred to herein as "summary tables" or more simply, "summaries".

Summary tables typically store aggregated information, such as "sum of PRODUCT_sales, by region, by month." Other examples of aggregated information include counts of tally totals, minimum values, maximum values, and average calculations.

Gupta, col. 2, lines 30-36.

According to this passage, Gupta teaches aggregate functions that are not used to obtain delta values, such as those derived from obtaining a difference between at least two values. The functions recited by the Gupta reference, such as SUM, COUNT and AVERAGE, are clearly not adapted to do so.

In the Response to Arguments section of the Office Action the Examiner indicated that Sun discloses materialized data which "is updated based on just new base data (i.e., the changes made to the base tables subsequent to the most refresh operations)." See, Sun, col. 3, lines 55, 56. While Sun may disclose "changes" to base tables, there is no disclosure in Sun indicating what such changes represent. Particularly, the Sun reference does not teach or suggest a first delta calculation module that calculates a plurality of delta values that represents the changes to the first materialized view, as specifically recited by independent claim 6. Based on the above analysis, it is apparent that Gupta does not teach, suggest or illustrate a first delta processing module that applies the plurality of delta values to the first materialized view, as recited by independent claims 6.

Because the Gupta reference does not disclose a first delta calculation module or a first delta processing module, it would be illogical for Gupta to disclose a second delta calculation module or a second processing delta module as recited by independent claim 6.

Further, as previously argued, the Sun reference clearly does not disclose the above claim limitations and, therefore, does not cure the deficiencies of the Gupta reference. Accordingly, neither Gupta nor Sun (nor a hypothetical combination thereof, even if proper) can render independent claim 6 as obvious.

For at least these reasons, the Examiner has failed to show a *prima facie* case of obviousness with regard to independent claim 6, as well as those claims depending therefrom. Accordingly, Appellants request the Board to reverse the rejection and allow independent claim 6 and those claims depending therefrom.

Conclusion

Appellants respectfully submit that all pending claims are in condition for allowance. However, if the Examiner or Board wishes to resolve any other issues by way of a telephone conference, the Examiner or Board is kindly invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,

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8. **APPENDIX OF CLAIMS ON APPEAL**

Listing of Claims:

1. A system for performing refresh operations, the system comprising:
 - a base table having a first plurality of data entries;
 - a first materialized view that comprises a second plurality of data entries, the second plurality of data entries being associated with the first plurality of data entries in the base table;
 - a refresh log that contains a plurality of changes in the base table; and
 - a module adapted to perform a refresh operation on the first materialized view using the second plurality of data entries, the module configured to; access the refresh log and the first materialized view; calculate a plurality of delta values from the plurality of changes in the refresh log and the second plurality of data entries in the first materialized view; apply the plurality of delta values to the second plurality of data entries in the first materialized view; and provide the plurality of delta values to a delta adaptation module for updating a second materialized view.
2. The system set forth in claim 1, comprising a delta calculation module (“DCM”) and a delta processing module (“DPM”) in the module, wherein the DCM

calculates the plurality of delta values and the DPM directs a plurality of operators based upon the plurality of delta values.

3. The system set forth in claim 2, wherein the first plurality of data entries and the second plurality of data entries each include one of a plurality of grouping identifiers that associate each of the first plurality of data entries with the second plurality of data entries.

4. The system for refreshing the table set forth in claim 3, wherein the delta calculation module DCM utilizes the plurality of group identifiers to combine the second plurality of data entries with the plurality of changes.

5. The system set forth in claim 1, wherein the second plurality of data entries each comprises a grouping field and a count field.

6. A system for performing a pipelined refresh, the system comprising:
a first materialized view derived at least partially from a base table;
a refresh log having a plurality of entries, each of the plurality of entries corresponding to a change in the base table,
a second materialized view derived at least partially from the first materialized view;
a refresh module that comprises; .

a first delta calculation module that calculates a plurality of delta values that represents the changes to the first materialized view;

a first delta processing module that applies the plurality of delta values to the first materialized view;

a delta adaptation module that receives the plurality of delta values from the first delta calculation module and calculates a plurality of changes to the second materialized view;

a second delta calculation module that obtains the plurality of changes to the second materialized view from the delta adaptation module; and

a second delta processing module that applies the plurality of changes to the second materialized view from the second delta calculation module to the second materialized view.

7. The system set forth in claim 6, wherein the plurality of entries in the refresh log correspond to a plurality of first materialized view entries in the first materialized view through a plurality of grouping identifiers that associate each of the plurality of entries with the plurality of first materialized view entries.

8. The system set forth in claim 6, comprising a plurality of operators utilized by the first delta processing module to modify the first materialized view based upon the plurality of delta values.

9. The system set forth in claim 6, wherein the second delta calculation module is configured to calculate a plurality of second materialized view delta values from the plurality of changes and deliver the plurality of second materialized view delta values to the second delta processing module.

10. The system set forth in claim 9, wherein the second delta processing module is configured to utilize the plurality of second materialized view delta values to apply the plurality of changes to the second materialized view.

11. A system for performing a refresh operation, comprising:
means for deriving a first materialized view from at least one base table;
means for accessing a refresh log and the first materialized view to perform the refresh operation on the first materialized view;
means for calculating a plurality of delta values by combining a plurality of changes in the refresh log and a plurality of entries in the first materialized view;
means for applying the plurality of delta values to the first materialized view; and
means for providing the plurality of delta values to a delta adaptation module for refreshing a second materialized view.

12. A method of performing a refresh operation, the method comprising:
deriving a first materialized view from a base table;
obtaining a refresh log and the first materialized view to perform the
refresh operation on the first materialized view;
calculating a plurality of delta values by combining a plurality of changes in the
refresh log and a plurality of entries in the first materialized view;
applying the plurality of delta values to the first materialized view; and
providing the plurality of delta values to a delta adaptation module for refreshing
a second materialized view derived from the first materialized view.

13. The method set forth in claim 12, wherein obtaining and calculating are
performed in a database management system (“DBMS”).

14. The method set forth in claim 12, wherein applying the plurality of delta
values comprises utilizing a plurality of operators to modify the first materialized view.

15. The method set forth in claim 12, comprising providing the plurality of
delta values to a delta processing module that applies the plurality of delta values to the
first materialized view.

16. The method set forth in claim 12, comprising:
 - processing the plurality of delta values in the delta adaptation module to create a plurality of second materialized view changes for the second materialized view;
 - calculating a plurality of second materialized view delta values that represent the plurality of second materialized view changes to be applied to the second materialized view; and
 - applying the plurality of second materialized view changes to the second materialized view.
17. The method set forth in claim 16, comprising combining a tuple table with the plurality of delta values and projecting the plurality of second materialized view changes based upon the tuple table and the plurality of delta values.
18. The method set forth in claim 16, wherein calculating the plurality of second materialized view delta values that represent the plurality of second materialized view changes to be applied to the second materialized view does not involve accessing a refresh log for the second materialized view.
19. The method set forth in claim 12, wherein the steps of the method are performed in the order in which they are recited.

20. A computer program, comprising:

- a machine readable medium;
- a refresh log stored on the machine readable medium, the refresh log containing a plurality of change entries; and
- a refresh manager stored on the machine readable medium, the refresh manager being adapted to refresh a first materialized view derived at least in part from a base table by computing a plurality of delta values in a delta calculation module based on the refresh log and the first materialized view, applying the plurality of delta values in a delta processing module to the first materialized view, and providing the plurality of delta values to a delta adaptation module derived from the first materialized view.

21. The computer program set forth in claim 20, wherein each of the plurality of change entries comprises a group identifier.

22. The computer program set forth in claim 20, wherein the delta calculation module combines the plurality of change entries and a plurality of entries in the first materialized view to create the plurality of delta values.

9. **EVIDENCE APPENDIX**

None.

10. **RELATED PROCEEDINGS APPENDIX**

None.